HERMLE
LABORTECHNIK

Instruction Manual
for
Refrigerated Microcentrifuge
Z 216 MK

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1. PRODUCT DESCRIPTION

1.1 Safety instructions

This symbol indicates safety instructions and points to potential dangerous situations. Before using the centrifuge the first time, please read the operating manual.

Failure to follow these instructions can result in personal injury an property damage .

Intended use includes the observance of all instructions in the instruction manual and carrying out inspection and maintenance.

1.2 Intended purpose

This Hermle centrifuge was designed only for the separation of materials or mixtures with different density, specifically for the preparation and processing of samples from the human body in context of an in-vitro-diagnostic use, to allow the use of in-vitro-diagnostic in accordance to its intended purpose. The designated device and its accessories listed in the technical documentation for this device are in accordance with Directive 98/79/EC on in-vitro-diagnostic medical devices.

Hermle centrifuges are intended exclusively for indoor use and for use by qualified personnel.

Only Hermle original rotors and accessories might be used. Any other use or intended use is considered improper. From the resulting damage the company Hermle Labortechnik is not liable.

1.3 Brief discription

The unit type Z 216 MK is a refrigerated microlitre centrifuge, which we offer in two voltage variations 230V or 120V.

The centrifuge can be used with angle rotors.

All parameters are accessible via buttons and selected with the central adjuster. All pre-selected and current values will be shown permanently on the LCD-display.

The centrifuge is powered by a maintenance-free induction motor.

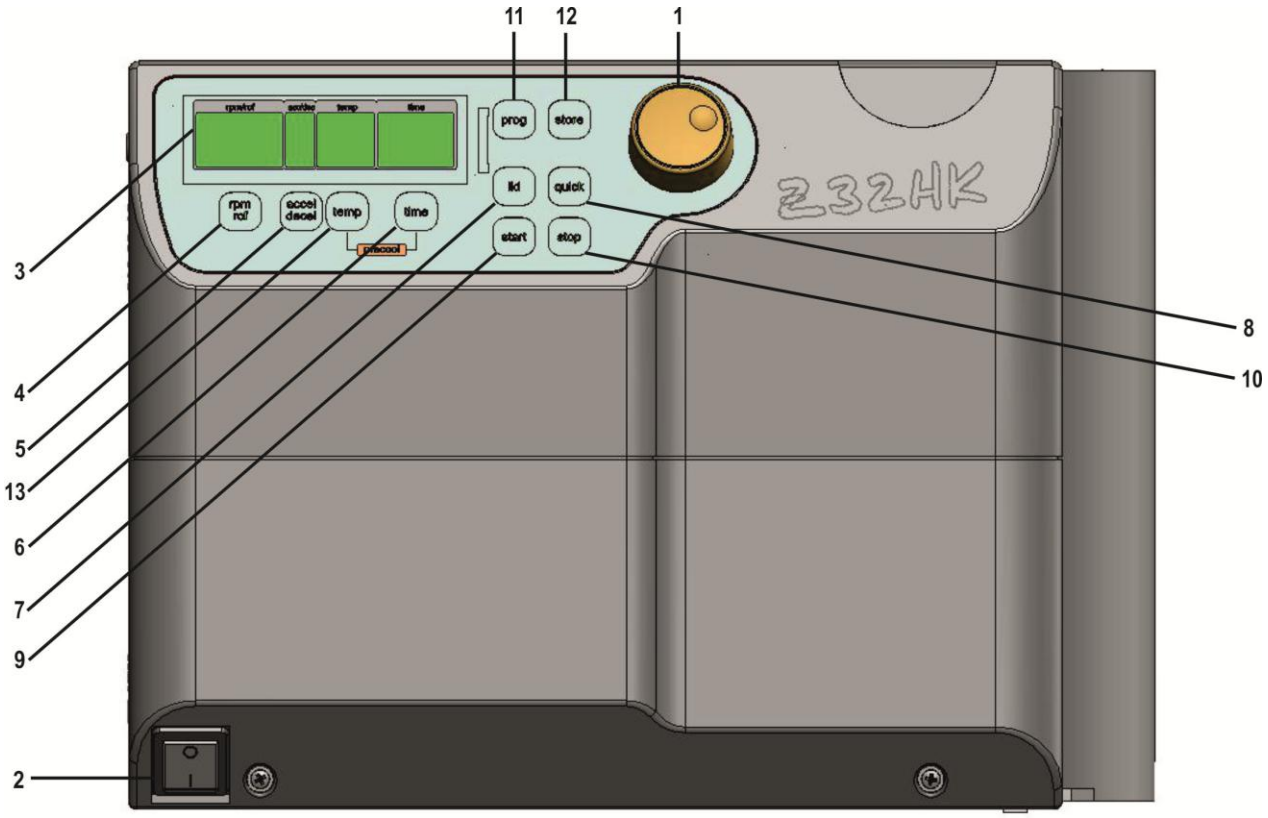
Detailed technical data are in "table 1: Technical data" (see APPENDIX P.III).

1.4 Delivery package

- 1 Centrifuge Z 216 MK
- 1 Operating Manual Z 216 MK
- 1 Rotor key

Rotor(s) / Accessories will be packed separate.

1.5 Operating and display elements



1	**central adjuster**	run parameters
2	**0-I**	power switch
3	**LCD**	control panel display
4	**rpm/rcf**	speed/ g-force
5	**accel/decel**	acceleration- / deceleration intensity
6	**time**	centrifugation time
7	**lid**	lid release
8	**quick**	short running
9	**start**	start centrifugation
10	**stop**	stop centrifugation
11	**prog**	calling stored programs
12	**store**	program store
13	**temp**	temperature indication

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1.5.1 LCD-Display

The following picture shows the individual elements of the LCD-display.

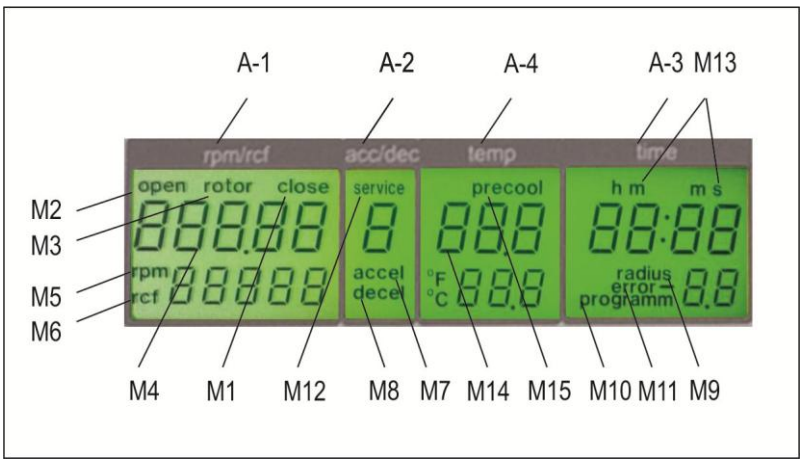

Figure 1

Display fields:

A-1	Display field – „rpm/rcf“
A-2	Display field – „acc/dec“
A-3	Display field – „time“
A-4	Display field - „temp

Messages/logos of the display fields:

M1	„close“	M8	„decel“	M15	„precool“
M2	„open“	M9	„radius“		
M3	„rotor“	M10	„program“		
M4	Rotor-No.	M11	„error“		
M5	„rpm“	M12	„service“		
M6	„rcf“	M13	h m s		
M7	„accel“	M14	„temperature“		

1.6 Signs and indications of the centrifuge

1.6.1 General

Instructions for disposal (see P. 34)

Direction of rotation – clockwise rotation for the rotor drive

Reference for loading rotors

1.6.2 Product-nameplate (Example)

Company address:	Hermle Labortechnik GmbH, Siemensstr. 25, D-78564 Wehingen
TYPE:	Type designation of the product
REF:	Order no. of the product
SN:	Serial number of the product
	Date of manufacture
MAX. Drehzahl:	max. allowed speed of the unit
KIN. EN.:	max. kinetic energy with corresponding rotor
U/I/f:	Allowable voltage / max. current / frequency
P:	Electrical input power
	Before operating, read the operating manual!
	Labeling, standards and guidelines that are considered

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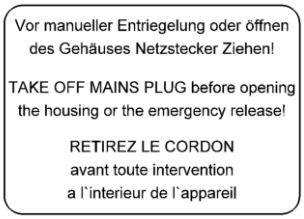
1.6.3 Warning and information signs

Warning
Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.

Four carrier must be used at all times on four place swing out rotors or damage will occur to the centrifuge. Such damage will not be covered under the product warranty.

Attention! Check the fastening of the rotor nut before each run.


Vor manueller Entriegelung oder öffnen des Gehäuses Netzstecker Ziehen!
TAKE OFF MAINS PLUG before opening the housing or the emergency release!
RETIREZ LE CORDON
avant toute intervention
a l`interieur de l`appareil

Take off mains plug before opening the housing or the emergency release

1.6.4 Danger, precautions and warranty

This device may only be operated by trained specialist stuff. They must have carefully read the operating manual and be familiar with the function of the device.

To protect people and environment the following precautions should be observed:

- During centrifugation, the presence of people and the setting up of hazardous materials is prohibited within 30 cm around the centrifuge according to the regulations of EN 61010-2-020.
- The HERMLE **Z 216 MK** is explosion-proof and must therefore not be operated in explosion-endangered areas or locations. Centrifugation of flammable, explosive, radioactive, or such substances, which chemically react with high energy, is strictly prohibited. The final decision on the risks associated with the use of such substances is the responsibility of the user of the centrifuge.
- Never spin toxic or pathogenic material without adequate safety precautions, i.e. centrifugation of buckets / tubes without or with defective hermetic sealings is strictly prohibited. The user is obliged to perform appropriate disinfection procedures in case dangerous substances have contaminated the centrifuge and or its accessories. When centrifuging infectious substances, always pay attention to the General Laboratory Precautions. If necessary, contact your safety officer!
- It is prohibited to run the centrifuge with rotors other than listed for this unit.
- Under no circumstances open the lid of the centrifuge while the rotor is still running or rotating with a speed of > 2m/s

1.6.5 Following rules must strictly be adhered to:

- Do not operate the centrifuge in case it is not installed correctly.
- Do not operate the centrifuge when dismounted (e.g. without housing).
- Do not run the centrifuge when mechanical or electrical assembly groups have been tampered with unauthorized persons.
- Do not use accessories such as rotors and buckets, which are not exclusively approved by HERMLE Labortechnik GmbH, except commercially available centrifuge tubes made of glass or plastic.
- Do not spin extremely corrosive substances, as they may cause material damages and impair mechanical resistance.
- Do not operate the centrifuge with rotors or buckets, which show any signs of corrosion or mechanical damage.

The manufacturer is responsible for safety and reliability of the centrifuge, only if:

- the unit is operated in accordance with this instruction manual.
- modifications, repairs or other adjustments are performed by HERMLE-authorized personnel and the electrical installation of the related location corresponds to the IEC-regulations.

1.6.6 Warranty

The centrifuge has been subjected to thorough testing and quality controls. In the unlikely case of any manufacturing faults occurring, the centrifuge and rotors are covered by warranty for a period of two years from date of delivery. This warranty becomes invalid in case of mishandling, damage and negligence and further in case of usage of inappropriate spare parts and / or accessories or unauthorized modification of the unit.

Technical modification rights are reserved by the manufacturer in respect to technical improvement!

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1.7 Installation of the centrifuge

1.7.1 Unpacking the centrifuge

Model **Z 216 MK** is supplied in a carton.

Remove the strap retainer, open the carton and remove the centrifuge. The instruction manual must always be kept with the centrifuge!

1.7.2 Space requirements

The centrifuge should be installed on an even solid surface, if possible on a laboratory cabinet / table or some other solid vibration free surface.

During centrifugation, the centrifuge must be placed in a way, that there is a minimum space of 30 cm on each side of the unit according to the standards EN 61010-2-020.

Do not place the centrifuge next to a window or a heater, where it could be disposed to excessive heat, as the performance of the unit is based on an ambient temperature of 23°C.

1.7.3 Installation

Follow these steps:

- Check whether power supply corresponds with the one named on the manufacturer's rating label, which is mounted on the rear panel.
- The power connection for the centrifuge requires a **separate** one-site protection with 16 A (type K)
- In case of emergency, there must be an emergency switch off installed outside the room in order to disconnect the power supply of the unit.
- Connect the centrifuge with the mains.

  (The socket for the power cord must be easy to reach respectively easy to disconnect).

  Switching it on using the mains power switch (I).

  Open the lid by using the button LID.
- Remove the transport securing device of the motor.

1.8 Basic adjustments

1.8.1 Adjustment of the rotortype

Before the first operation resp. after each rotor change, you have to settle the respective rotor type. You find each rotor type in the printed order number on the rotor.

Example:

angle rotor 220.87 V11 ≙ rotortype „87“

Switch on the unit and open the lid. Now press simultaneously the keys “lid “ (7) and “stop” (10). In the display “rpm/rcf” (A-1) then appears the old settled rotor type, i. e. “87”. With the potentiometer (1) you can settle the used rotor now. (see figure 2) To adopt the data in the unit please press the “start” (9) key. Inside the display (A-1) the stroke “store” appears to the confirmation.

Now all important rotor parameters for the centrifuge are stored.

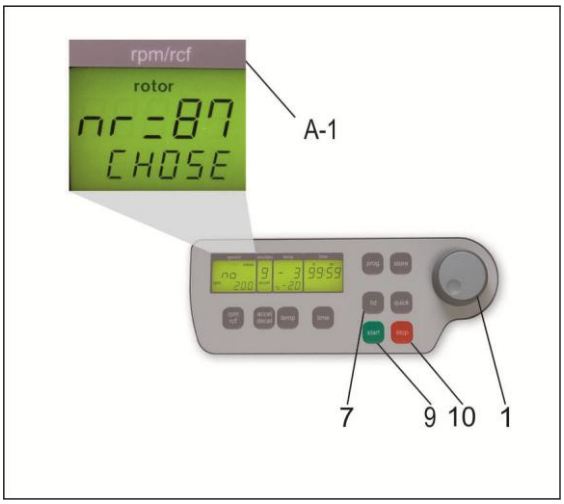

Figure 2

Attention: Set rotor must always match with the used rotor, otherwise you might damage the unit.

The rotor type can be checked during the run by pressing the key "lid" (7).

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1.8.2 Access to mode "Operating Data"

At commissioning of the centrifuge, you have the options to make the following basic settings:

- Temperature indication °C or °F
- Acoustic signal turn on/off
- Keyboard sound turn on/off
- Volume pre-selection of sound signal
- Song selection of sound signal "end of run"

If the centrifuge is still turned off, press simultaneously the keys „time“ (6) and „lid“ (7) and turn on the main switch of the centrifuge. Now release both keys again. As a result a display test is executed for approx. 5 seconds. All possible indications will appear at the same time (see figure 3).

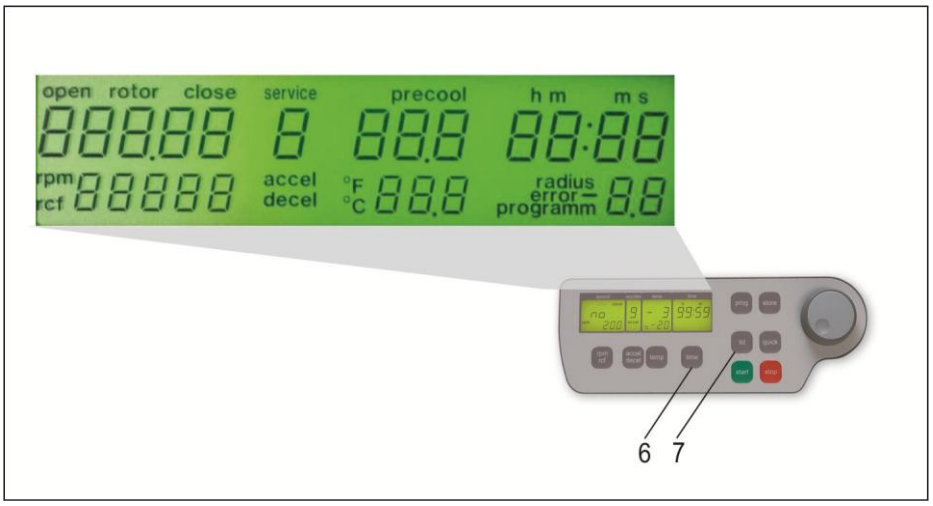

Figure 3

ATTENTION:

- **Please notice that you must enter the program as described under point 1.8.2 to change the adjustments of the points 1.8.3 - 1.8.8. After you have stored the settings you change the normal program mode again by switch off the centrifuge for a short while.**

- **All changed settings must be confirmed by the key „start“ (9). As an optical confirmation appears the word „store“ in the display „rpm/rcf“(A-1) - Only then the pre-selections are valid! (see figure 4)**

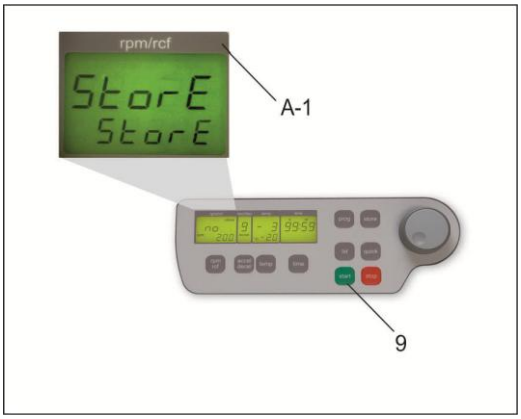

Figure 4

1.8.3 Temperature indication

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) appears the word „service“. Now select the letter „C“ with the adjusting knob (1). As a result in the display „rpm/rcf“ (A-1) appear the words „CELSI/temp“. If you press the key „rpm/rcf“ (4) now, the word „CELSI“ flashes and you can change the display into Fahrenheit „FAREN“ with the adjusting knob (1) (see figure 5).

After you have stored the settings (see 1.8.2) you change to the normal program mode again by switch off the centrifuge for a short while.

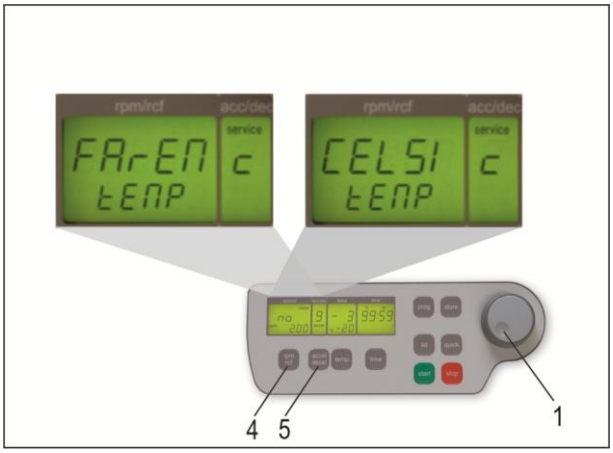

Figure 5

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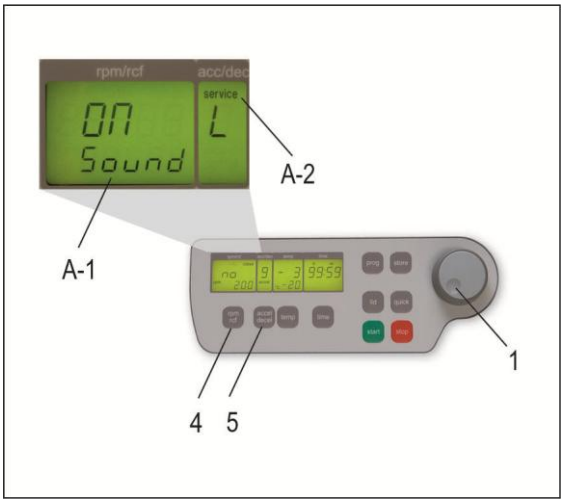
1.8.4 Signal turn on / off (optional)

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „L“. with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (4) the words „On Sound“. If you press the key „rpm/rcf“ (4) now, the word „On“ flashes and you can switch off the sound with the adjusting knob (1) (see figure 6).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.



Firgure 6

1.8.5 Volume pre-selection of sound signal (optional)

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „U“ with the adjusting knob (1). As a result appear in the display „rpm/rcf“ (A-1) the words „Vol=0- 9/Sound“. After pressing the key „rpm/rcf“ (4), you can adjust the desired volume between 0 (low) and 9 (loud) with the adjusting knob (1) (see figure 7).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

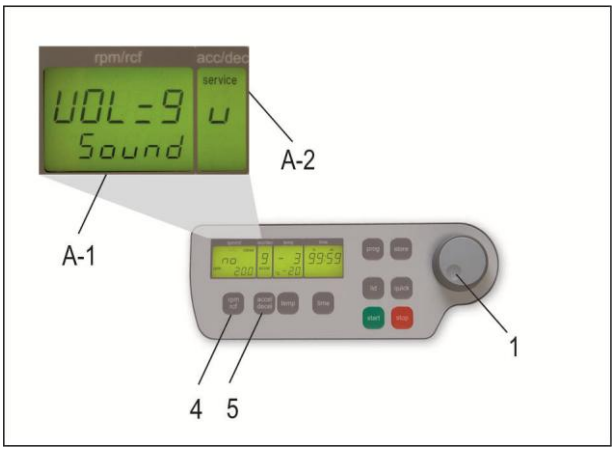


Figure 7

1.8.6 Song selection for sound signal - end of run (optional)

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „G“. with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ SonGo/Sound“. After pressing the key „rpm/rcf“ (4), you can select a song with the adjusting knob (1). (see figure 8).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

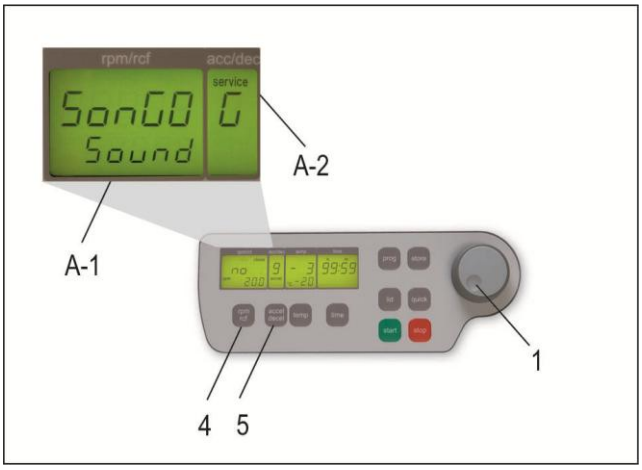


Figure 8

1.8.7 Keyboard sound turn on / off (optional)

Proceed as described under point 1.8.2 to enter this program mode and then press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“. Now select the letter „b“. with the adjusting knob (1). As a result appears in the display „rpm/rcf“ (A-1) the word „ON/BEEP“. After pressing the key „rpm/rcf“ (4), you can turn the keyboard sound (On) or (Off) with the adjusting knob (1). (see figure 9).

After you have stored the settings (see 1.8.2) you changed to the normal program mode again by switch off the centrifuge for a short while.

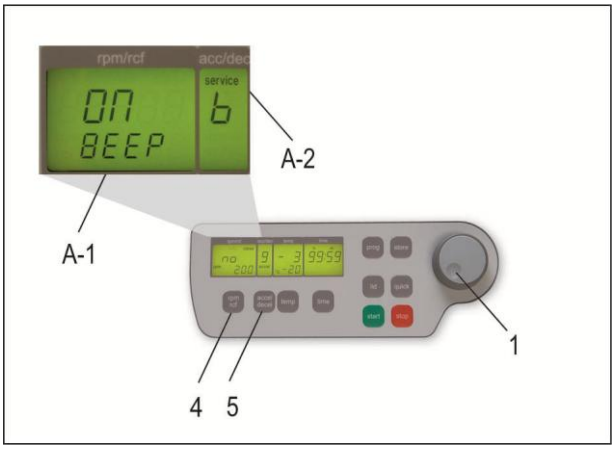


Figure 9

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1.8.8 Call up operating data (by skilled or service engineer only!)

In the mode „Basic Adjustments“ you can call up the operating data of the centrifuge. Please proceed as described under point 1.8.2 to enter this program mode. Press the key „accel/decel“ (5). In the display „accel/decel“ (A-2) flashes the word „service“.

With the adjusting knob (1) the different information can be called up:

A = previous starts of the centrifuge
H = previous operating hours
S = software version
r = converter software
E = list of previous error massage
h = running time of the motor

The list of the last 99 error messages can be looked over by pressing the key „rpm/rcf“ (4) and scroll through it by the adjusting knob (1). The respective error codes appear in the display „rpm/rcf“ (A-1). Please look up in „Table 6: error messages“ (see APPENDIX S. VI).

Here as well you must shortly switch off the centrifuge for changing to the normal program mode again.

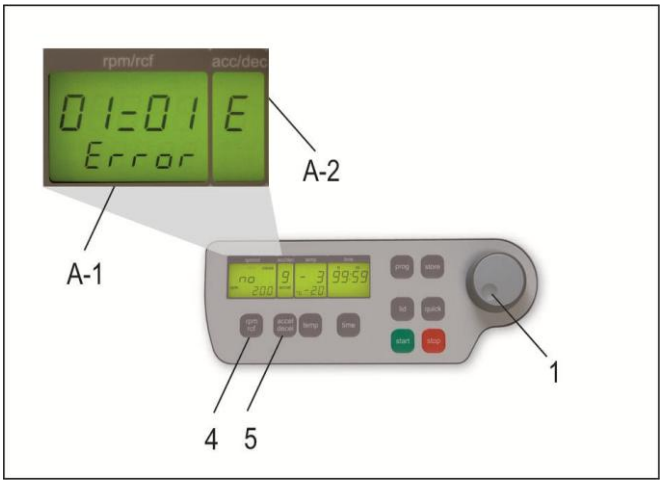

Figure 10

2. OPERATION

2.1 Mounting and loading angle rotor

2.1.1 Installation of rotors

Clean the drive shaft as well as the rotor fixing with a clean, grease-free piece of cloth. Place the rotor onto the drive shaft. (see figure 11) Take care that the rotor is fully installed onto the motor shaft.

Figure 11

Figure 12

Hold the rotor with one hand and secure the rotor to the shaft by turning the fixing nut clockwise. Tighten fixing nut with enclosed allen key (see figure 12)

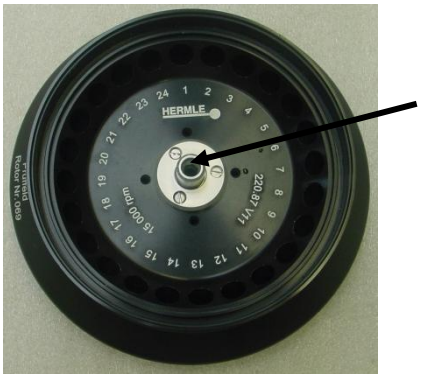

Figure 13

ATTENTION: For safety always ensure that rotor fixing screw is tightened before each run!! (see figure 12)

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2.1.2 Loading angle rotors

Rotors must be load symmetrically and with equal weight (see figure 15+17). The adapter may only be load with the appropriate vessels. The weight differences between the filled vessels are as low as possible to keep. Therefore we recommend to weighting with a balance. This reduces the wear of drive and the acoustic operating noise.

On each rotor is designated how large the maximum load per hole is. (It is allowed to operate e.g. a 12-place-rotor with 2 or 4 loaded tubes only. But the loaded borings must be opposite each other).

Figure 14: CORRECT

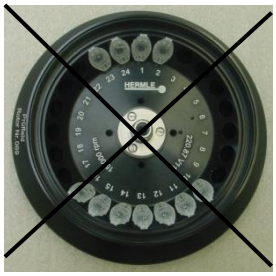

Figure 15: WRONG

ATTENTION!

Do not operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Do not operate with extremely corrosive substances, which could damage the rotor and buckets.

In case of any questions, please contact the manufacturer!

2.1.3 Loading and overloading of rotors

All approved rotors are listed with their maximum speed and maximum filling weight in „table 2 permissible net weight“ (see APPENDIX P. IV).

The maximum load permitted for a rotor, which is determined by the manufacturer, as well as the maximum speed allowed for this rotor (see label on rotor), must not be exceeded. The liquids the rotors are loaded with, should have an max. homogeneous density of 1,2 g/ml or less when the rotor is running at maximum speed.

In order to spin liquids with a higher density, the speed has to be reduced according to the following formula:

$$\text{Reduced speed } n_{red} = \sqrt{\frac{1{,}2}{higher\ density}} \times \text{max. speed } (n_{max}) \text{ of the rotor}$$

Example:

$$n_{red} = \sqrt{\frac{1{,}2}{1{,}7}} \times 4.000 = 3.360 \text{ rpm}$$

If In case of any questions, please contact the manufacturer!

2.1.4 Removing the rotor

Untighten the rotor fixing nut complete (2. screw over the stiff point) and lift the rotor vertical out of the centrifuge. (see figure 12)

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2.2 Lid

2.2.1 Lid release

After the run, respectively closing the lid of the centrifuge, it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). If there is a rotor in the centrifuge, it appears additional the word „rotor“ (M3), as well as the code number of the respective rotor, which is in the centrifuge i. e. „220.72“ (M4). If there is no rotor in the centrifuge it flashes the word „rotor“ (M3) and additional the word „no“ (M4).). By pressing the key „lid“ (7) you can release the lid of centrifuge. As soon as the motor driven lid lock is completely released, it appears the word „open“ (M2). Now you can open the lid of the centrifuge.

All with number marked passages refer to figure 18

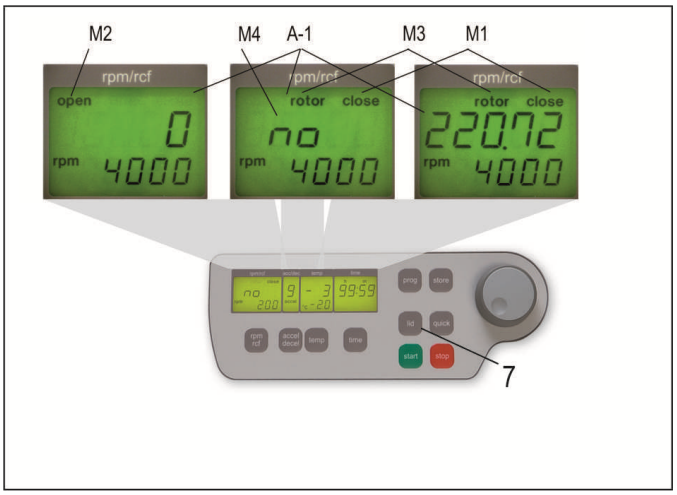

Figure 18

During the run you can call up the rotor type at any time by pressing the key “lid” (7).

2.2.2 Lid lock

The lid must only be lay down slightly. A motor driven lid lock closes the lid, at the same time disappears the word „open“ (M2).

As a sign that the centrifuge is ready for starting it appears in the display „rpm/rcf“(A-1) the word „close“ (M1). Simultaneously it appears in that display the word „rotor“ (M3), as well as the code number of the rotor, which is in the centrifuge i. e. „nr 22x.xx“ (M4). With that all rotor specifically data, like e. g. max. speed, acceleration etc., are adopted.

All with number marked passages refer to figure 18

ATTENTION: Don't grip your fingers between lid and device or locking mechanism when closing the lid!

2.3 Preselection

2.3.1 Preselection of speed / RCF-value

Through the key „rpm/rcf“ (4) this pre-selection is activated. By pressing the key once the word „rpm“ (M5) flashes. By pressing the key once again the pre-selection of the centrifugal forces may be chosen. Then it appears the flashing word „rcf“ (M6). You can set the desired values with the adjusting knob (1). In the display (A-1) the regulated value is shown permanently, before, during and after the run.

All with number marked passages refer to figure 19

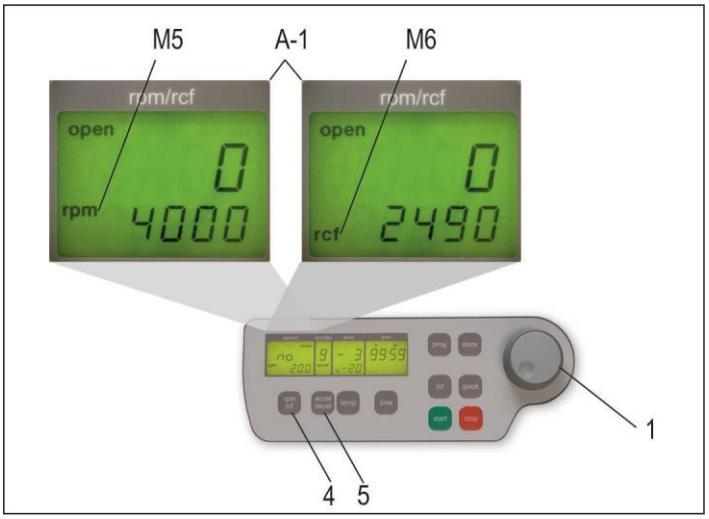

Figure 19

As long as no rotor is inserted, the speed is adjustable between 200 rpm and maximum revolution of the centrifuge.

If there is a rotor in the centrifuge the speed can only be pre-selected until the maximum permissible revolution of that rotor. It is the same with the pre-selection of the RCF-value. The setting range is between 20 xg and the maximum permissible centrifugal force of the rotor.

See „table 4: max. speed and RCF-values for permissible rotor“ (see APPENDIX P. V). There are listed all important values.

ATTENTION:

Please also check the maximum permissible revolutions of your test tubes! (Producer Indication)

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2.3.2 Preselection of running time

The running time can be pre-selected in three different ranges from 10 seconds up to 99 hours 59 minutes.

1. Range from 10 seconds up to 59 minutes 50 seconds in steps of 10 seconds
2. Range from 1 hour up to 99 hours 59 minutes in steps of 1 minutes
3. Range continuous run „cont", which can be interrupted by the key "stop" (10).

The running time can be pre-selected with the lid open or closed.

To activate the setting of the running time press the key „time" (6).

In the display „time" (A-3) flashes the indication „m : s" or „h : m", depending on the previous setting.

To set the desired value use the adjusting knob (1). After exceeding of 59 min 50 sec the indication changes automatically into „h : m". After exceeding of 99 hours 59 min the word „cont" appears in the display „time" (A-3). That continuous run can only be interrupted by pressing the key „stop" (10). The time countdown as soon as the set speed is reached.

The display shows always the remaining running time. (see figure 20)

All with number marked passages refer to figure 20

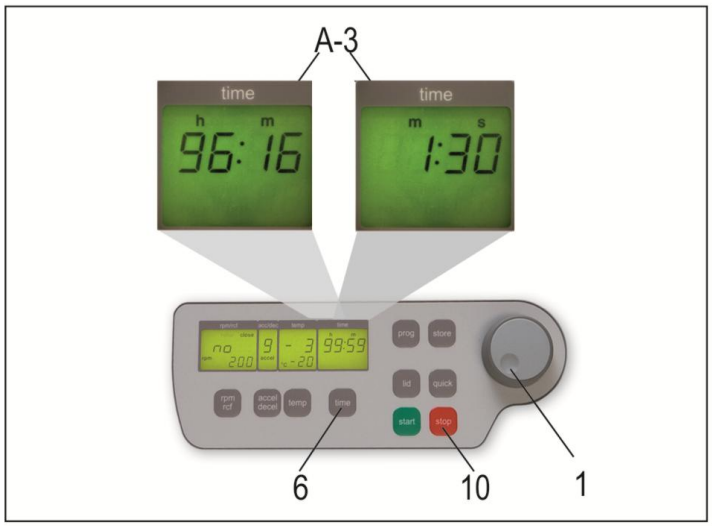

Figure 20

2.3.3 Preselection of brake intensity and acceleration

Through the key „accel/decel“ (5) this function is activated.

By pressing the key once the word „accel“ (M7) flashes in the display „accel/decel“ (A-2). The desired acceleration can be pre-selected by the adjusting knob (1). The value 0 is equivalent to the lowest and the value 9 to the highest acceleration.

By pressing the key „accel/decel“ (5) twice, in the display „accel/decel“ (A-2) indicates the word „decel“ (M8). Now the desired brake intensity can be pre-selected by the adjusting knob (1). The value 9 is equivalent to the shortest and the value 0 to longest possible brake time.

All with number marked passages refer to figure 21

See „table 5: acceleration and deceleration times“ (APPENDIX P. V). There are shown the acceleration and deceleration times for the acceleration and deceleration stages 0 to 9 for permissible rotors.

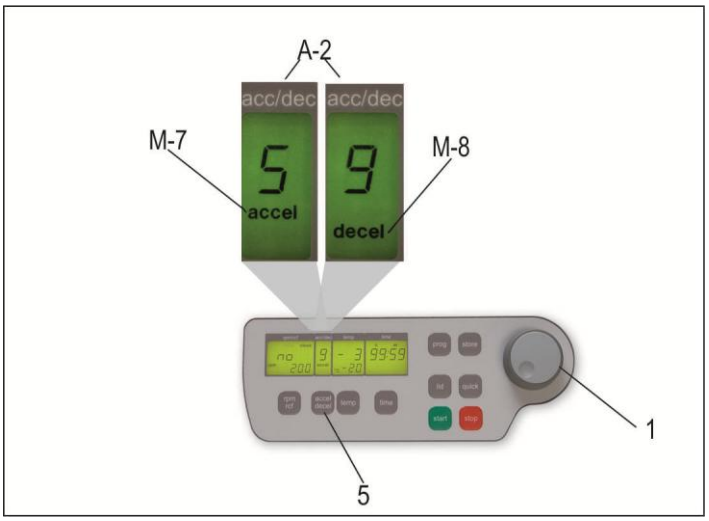

Figure 21

 © Hermle Labortechnik GmbH

2.3.4 Pre-selection of temperature

This funktion is activated by the key „temp“ (13). After pressing that key in the display „temp“ flashes the indication „°C“ (A-4). By the adjusting knob (1) the desired test temperature can be pre-selected in steps of 1°C in a range from -20°C up to +40°C.

The value is indicated permanently in the display (figure 22) - before, during and after the run.

Please notice the respective lowest temperatures of the rotors at maximum speed!

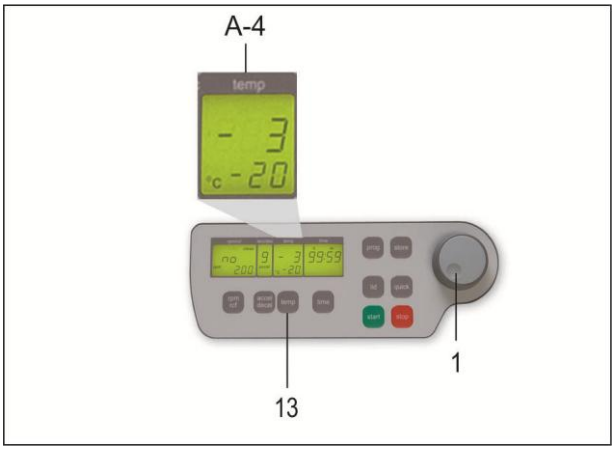

Figure 22

2.3.5 Pre-cooling

If the samples are temperature-sensitive it is useful to pre-cool the centrifuge, the rotor and eventually the buckets to the needed working temperature. Therefore insert the desired rotor and pre-set the respective temperature. By simultaneous pressing of the keys “temp” (13) and “time” (6) you start the run. While running the unit chooses automatically a rotational speed that is equivalent to 20 % of the permitted rotational speed of the respective rotor. After the pre-set temperature is reached you can leave the pre-cooling run with the “stop” key (10).

Depending on the inserted rotor the pre-cooling goes between approx. 10 and 20 min.

All with number marked passages refer to figure 23

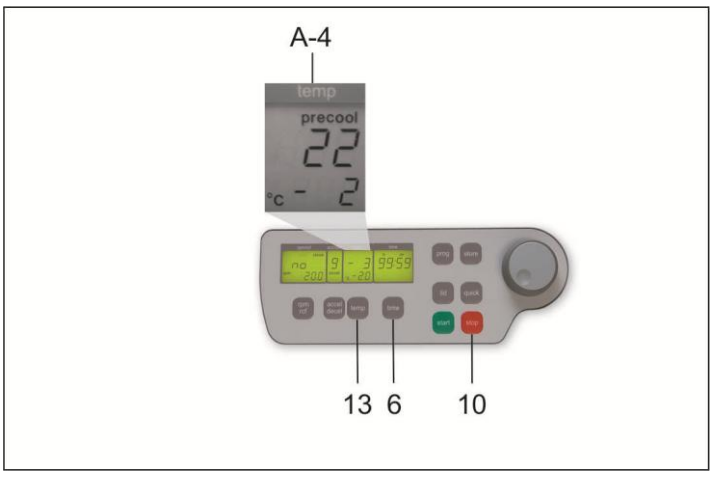

Figure 23

2.4 Radius correction

If you use adapters or reducers it could change the centrifugal radius of the respective rotor. In that case you can correct the radius manually. Please proceed as follows:

Press the key „time“ (6) and the key „prog“ (11) at the same time and hold them.

In the display „time“ (A-3) appears the word „radius“ (M9). By the adjusting knob (1) you can preselect then the respective radius correction (see table 7, APPENDIX P. VII) in steps of 0,1 cm.

As soon as you have set a radius correction the word „radius“ (M9) appears. This hint is as long visible as you put the radius correction back to 0 again.

All with number marked passages refer to figure 24

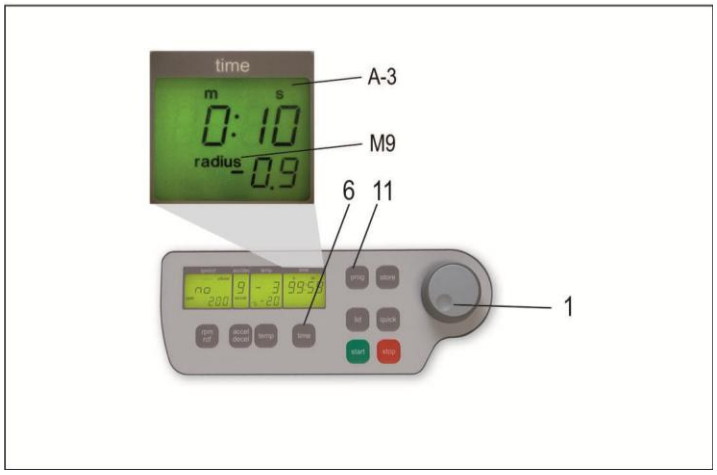

Figure 24

 © Hermle Labortechnik GmbH

2.5 Program

2.5.1 Storage of programs

You can store up to 99 runs with all relevant parameters, incl. the used rotors. You can use any free program number and call it up again.

Put the needed rotor into the centrifuge. By pressing the key „prog“ (11) in the display „time“ (A-3) appears the word „program“. With the adjusting knob (1) you can chose the desired program number.

If a program number is already occupied in the display „rpm/rcf“ (A-1) will appear the words „rotor” (M3) and „22x.xx“ (M4). In case of free program numbers it appears 0.

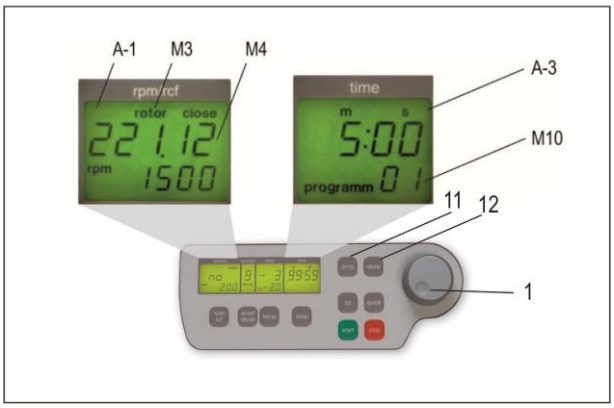

Figure 25

Close the lid of the centrifuge. Now proceed as already described to set all important run parameters. If the lid isn't closed when storing the program, in the display „rpm/rcf" (A-1) flashes alternately the word „FirSt" and „CLOSE Lid" (see figure 26).). If you want to start the run without storing the programm, in the display "rpm/rcf" (A-1) flashes alternately the word ""First" and "PrESS StoreE" (see figure 27).

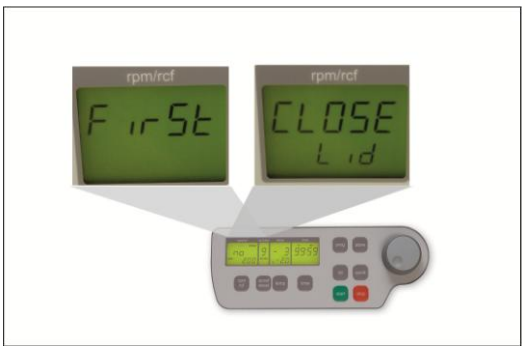

Abbildung 26

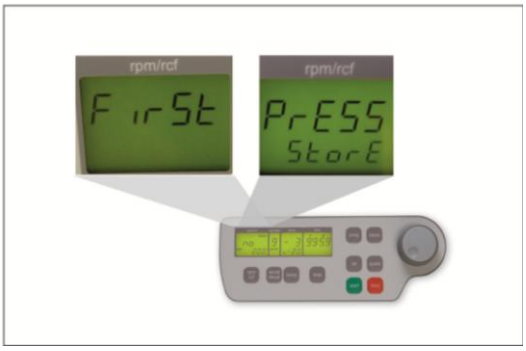

Abbildung 27

For adaption of data press the key „store“ (12) for approx. 1 second. If the program is store correctly, the word StorE appears in the display „rpm/rcf" (A-1). As a result the word „program“ (M10) disappears. As soon as the key „store“ (12) is no longer anymore, it reappears the word „programm xx“ (M10) – the (xx) stands for the chosen program place.

If all program numbers are occupied you can take an old number that is not necessary anymore and just put in the new parameters.

All with number marked passages refer to figure 26 and 27.

2.5.2 Recall of stored programs

To recall stored programs press the key „prog“ (11) while the lid is already closed. Inside the display „time“ (A-3) appears „programm --“(M10). With the adjusting knob (1) you pre-select the desired program number.

In the respective displays there will appear the stored values for that program.

If there is not the right rotor inside the centrifuge for the pre-selected program, in the display „rpm/rcf“ (A-1) flashes the word „rotor“ (M3). At the same time the word „FALSE“ and the stored rotor number „22x. xx“ (M4) will flashing by turns.

All with number marked passages refer to figure 28.

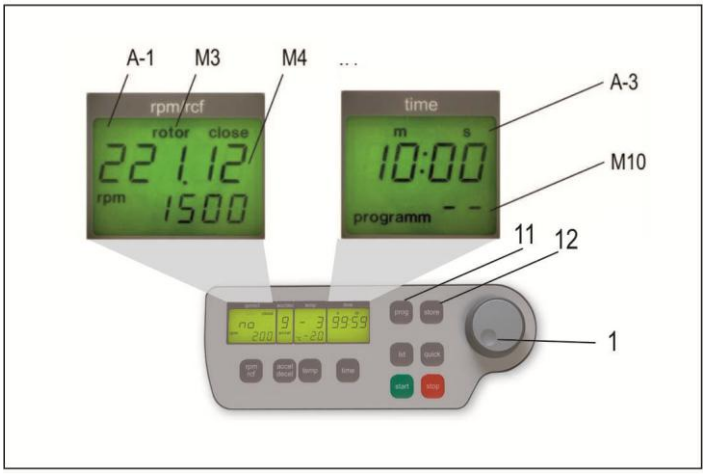

Figure 28

2.5.3 Leaving program mode

To leave the program mode just press the key „prog“ (11). Then inside the display „time“ appears the word „programm".

Set the display to „programm--“ (M10) with the adjusting knob (1).

All with number marked passages refer to figure 28.

2.6 Starting and stopping the centrifuge

2.6.1 Starting the centrifuge

You can start the centrifuge either with the „start“ key (9) or the „quick“ key (8).
By the „start“ key (9) you can start stored runs or runs with manually pre-selected parameters.
When the respective pre-selected running time has ended then the centrifuge will stop automatically.
By the „quick“ key (8) you can start runs, which will last just a few seconds.
By pressing the „quick” key (8) the centrifuge accelerates up to the pre-selected revolution.
In the display „time“ (A-3) the passed running time is indicated from the date of pressing the „quick” key (8).
By releasing the „quick” key (8) the centrifuge stops and the running time is indicated until the opening of the lid.

All with number marked passages refer to figure 29

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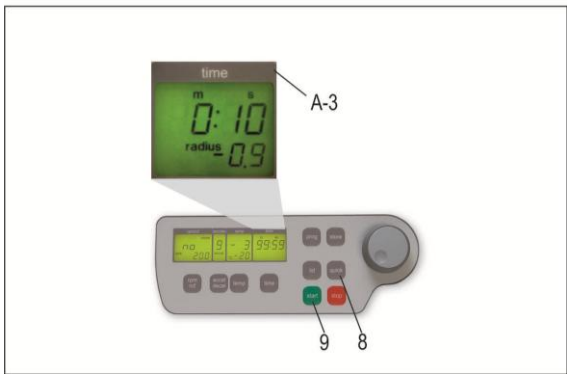

Figure 29

2.6.2 The "STOP" key

By the „stop“ key (10) (see figure 30) you can interrupt the run at any time. After pressing the key the centrifuge decelerates with the respective pre-selected intensity down to stand still.

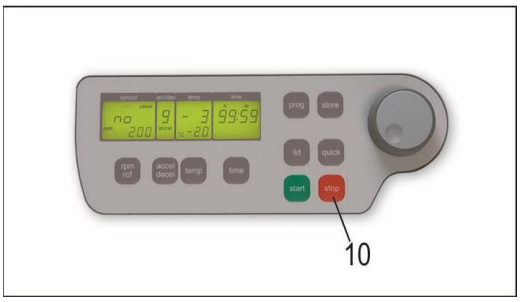

Figure 30

2.7 Imbalance detection

In case of the rotor not being equally loaded, the drive will turn off during acceleration. The rotor decelerates to stand still.
When in the display “time” (A-3) the word “error” (M11) together with the number “01” appear, the weight difference of the samples is too huge. Weigh out the samples exactly!
Load the rotor as described in chapter 2.1.2 and 2.1.3.

When inside the display “time” (A-3) the word “error” together with the number “02“ (see figure 31) appear, there could be following reasons: The imbalance switch is defective.

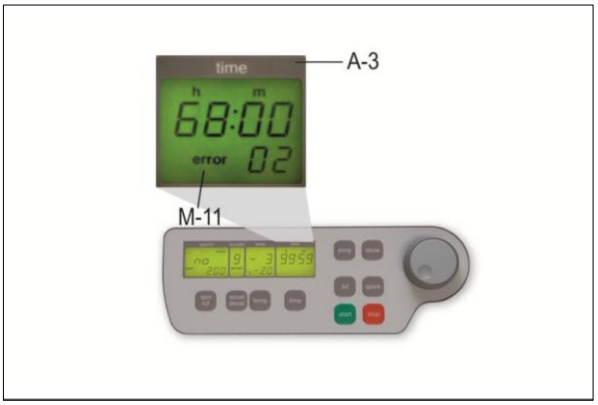

Figure 31

3. MAINTENANCE

3.1 Maintenance and cleaning

3.1.1 General

Care:

Maintenance of the centrifuge is confined to keeping the rotor, the rotor chamber and the rotor accessories clean as well as to regularly lubricating the rotor insert bolts of a swing out rotor (if available).

Lubricants containing molycote and graphite are not allowed.

Please pay special attention to anodized aluminum parts. Breakage of rotors can be caused even by slightest damages.

In case of rotors, buckets or tube racks getting in touch with corrosive substances the concerned spots have to be cleaned carefully.

Corrosive substances are for instance: alkalis, alkaline soap solutions, alkaline amines, concentrated acids, solutions containing heavy metals, water-free chlorinated solvents, saline solutions, e.g. salt water, phenol, halogenated hydrocarbons.

Cleaning – units, rotors, accessories:

- Turn the device off and disconnect it from the power supply before you begin any cleaning or disinfecting. Do not pour liquids into the housing interior.
- Do spray disinfectant on the device.
- Thorough cleaning not only has its purpose in hygiene but also in avoiding corrosion based on pollution.
- In order to avoid damaging anodized parts such as rotors, reduction plates etc., only pH-neutral Detergents with a pH-value of 6-8 may be used for cleaning. Alkaline cleaning agents (pH-value > 8) must not be used.
- After cleaning, please ensure all parts are dried thoroughly, either by hand or in a hot-air cabinet (max. Temperature + 50°C).
- It is necessary to coat anodized aluminium parts with anti-corrosion oil regularly in order to increase their life-spans and reduce corrosion predisposition.
- Due to humidity or not hermetically sealed samples, condensate may be formed. The condensate has to be removed from the rotor chamber with a soft cloth regularly.

The maintenance procedure has to be repeated every 10 to 15 runs, but at least once a week!

- Connect the unit to the power supply, after the equipment is completely dry.
- Do not carry out disinfection with UV-, beta- and gamma-rays or other high energy radiation.
- Metal rotors can be autoclaved.
- Rotor lid and adapters can also be autoclaved (max. 121°C, 20 min).
- The tube racks are made of PP and **cannot** be autoclaved at 134°C.

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3.1.2 Cleaning and disinfection of the unit

1. Open the lid before you turn off the unit. Disconnect it from the power supply.
2. Open the rotor nut by turning the rotor key counter clockwise.
3. Remove the rotor.
4. For cleaning and disinfection of the unit and the rotor chamber using the above mentioned cleaner.
5. Clean all accessible areas of the device and its accessories, including the power cord with a damp cloth.
6. Wash the rubber seals and rotor chamber thoroughly with water.
7. Rub the dry rubber seals with glycerol or talc to prevent these to becoming brittle. Other components of the unit, e.g. the lid lock, motor shaft and rotor must **not** be greased.
8. Dry the motor shaft with a soft, dry and lint-free cloth.
9. Control the unit and accessories for damage.

Remove at least every six months adherent dust from the ventilation slots in the centrifuge by using a soft brush.

Before doing that, please switch off the unit and disconnect the unit from the power supply.

3.1.3 Cleaning and disinfection of the rotor

1. Clean and disinfect the rotors, rotor lids and adapters with the above mentioned cleaner.
2. Use a bottle brush to clean and disinfect the rotor bores.
3. Rinse the rotors, rotor lid and adapter with clear water. Particular the drillings of angle rotors.
4. For drying of the rotors and accessories set them on a towel. Place the angle rotors with bores down, to dry them to.
5. Dry the rotor cone with a soft, dry and lint-free cloth and look for damage. Do not grease the rotor cone.

3.1.4 Disinfection of aluminum rotors

In case of infectious material spilling into the centrifuge, the rotor and rotor chamber have to be disinfected right after the run. Rotors may be autoclaved at a maximum temperature of 121°C.

3.1.5 Disinfection of PP-rotors

Autoclaving

The recommended time for autoclaving: 15 – 20 min at 121°C (1 bar)

ATTENTION: The sterilization time of 20 min. must not be exceeded. Sterilization again and again will cause reduction of the mechanical resistance of the plastic material

Before the autoclaving the PP-rotor and adapter must thoroughly be cleaned to avoid the burning in of dirty residues.

You can disregard the consequences of some chemical residues to plastic materials at ambient temperatures. But at the high temperatures of the autoclaving those residues may corrode and destroy the plastic. The objects must be thoroughly washed up with distilled water after the cleaning but before the autoclaving. Residues of any cleaning liquids may cause fissures, whitening and stains.

Gas sterilization

Adapters, bottles and rotors may be gas sterilized with Ethylenoxyd. According to the duration of the application you may give long enough an airing to the items after the sterilization and before using them again.

ATTENTION: Because the temperature may rise during the sterilization, rotors, adapters and bottles must not be closed respectively must be totally unscrewed

Chemical sterilization

Bottles, adapters and rotors may be treated with the usual liquid disinfectants.

ATTENTION: Before applying any other cleaning resp. Decontamination method than recommended by the manufacturer, contact the manufacturer to ensure that it will not damage the unit or the rotor.

3.1.6 Glass breakage

With high g-values, the rate of glass tube breakage increases. Glass splinters have to be removed immediately from rotor, buckets, adapters and the rotor chamber itself. Fine glass splinters will scratch and therefore damage the protective surface coating of a rotor. If glass splinters remain in the rotor chamber, fine metal dust will build up due to air circulation. This very fine, black metal dust will extremely pollute the rotor chamber, the rotor, the buckets and the samples.

If necessary, replace the adapters, tubes and accessories to avoid further damages. Check the rotor bores regularly for residues and damages.

ATTENTION: Please check the relevant specifications of the tubes centrifuges with the manufacturer!

3.2 Life time of rotors, round and rectangular buckets, accessories

Rotors and rotor lid made of aluminum or stainless steel, have a operating time of **max. 7 years** from first use.

Transparent rotor lids and caps made of PC or PP as well as rotors, tube racks and adapters of PP have a maximum operating time up to **3 years** from first use.

Condition for the operating time: Proper use damage-free condition, recommended care.

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4. TROUBLE SHOOTING

4.1 Error message: Cause / Solution

The error messages are listed to help localize possible errors faster.

The diagnose referred to this chapter may not always be the case, as they are only theoretically occurring errors and solutions.

Always, please keep us informed about any kind of error occurring, which is not listed in this chapter. Only through your information we are able to improve and complete this operation manual.

Many thanks in advance for your support.

HERMLE Labortechnik GmbH

4.2 Survey of possible error messages and their solutions

4.2.1 Lid release during power failure (Emergency Lid Release)

In case of power failure or malfunction, the lid of the centrifuge can be opened manually in order to protect your samples.

Please proceed as follows (see figure 32):

- **Switch the centrifuge off and unplug the power cord, wait until the rotor stands still (this may take several minutes)**
- **At the left side of the centrifuge housing there is a plastic stopper. Remove this stopper and behind it there is a hexagon nut.**
- **Take the delivered box spanner, put him in the hole and lock the box spanner with hexagon nut (see figure 32).**
- **Now turn the box spanner to the right side (clockwise) up to the limit.**
  ATTENTION: Just turn to the limit, don´t tighten the nut.
- **Now open the lid of the centrifuge.**
- **Switch the centrifuge on again, for go on working.**

Figure 32

4.2.2 Description of the error message system

The error message „error“ (M11) is shown in the „time“ (A-3) display (see figure 33). Detailed information about possible error messages are in „table 6: error messages" (see Appendix P.VI).

Figure 33

 © Hermle Labortechnik GmbH

5. RECEIPT OF CENTRIFUGES TO REPAIR

Health risk from contaminated equipment, rotors and accessories

In case of returning the centrifuge for repairing to the manufacturer, please notice the following:

The centrifuge **must** be decontaminated and cleaned before the shipment for the protection of persons, environment and material.

Decontamination certificate at goods return delivery (see APPENDIX P. IX)

We reserve the right to accept contaminated centrifuges.

Further on all costs occurred for the cleaning and disinfection of the units will go to the debit of the customer's account

6. TRANSPORT, STORAGE AND DISPOSAL

6.1 Transport

Before transporting, take out the rotor.
Only transport the unit in the original packaging.
Use a transport aid for transporting over longer distances to fix the motor shaft.

	Air temperature	rel. humidity	Air pressure
General transportation	-25 bis 60 °C	10 bis 75 %	30 bis 106 kPa

6.2 Storage

During storage of the centrifuge the following environmental conditions must be observed:

	Air temperature	rel. Humidity	Air pressure
in transport packaging	-25 bis 55 °C	10 bis 75 %	70 bis 106 kPa

6.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of the electrical and electronic devices in the European Community:.

The disposal of the electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes the product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:

Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

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7. APPENDIX

EG - Conformity Declaration II
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Redemption form / Decontamination certificate IX

EG - Conformity Declaration

EG Konformitätserklärung
EC Conformity Declaration

CE

Hermle Labortechnik GmbH - Siemensstr. 25 - D-78564 Wehingen – Germany

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The Product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produkttyp
Product type

Laborzentrifugen mit Zubehör nach „IVD (sonstige Produkte)"
Laboratory centrifuge with accessories to "IVD (other device)"

Typenbezeichnung
Typ designation

Z 206 A; Z 233 M-2; Z 216 M; Z 306; Z 326; Z 366; Z 383; Z 400; Z 446; Z 513;
Z 216 MK; Z 32 HK; Z 326 K; Z 366 K; Z 36 HK; Z 383 K; Z 446 K; Z 400 K; Z 513 K

Einschlägige EG-Richtlinien / Normen
Relevant EC directives / standards

98/79/EG(Anhang/Annex III); 2006/95/EG; 2004/108/EG
EN 61010-1; EN 61010-2-020: 2007-03; EN 61010-2-101
DIN EN ISO 14971; DIN EN ISO 13485

HERMLE
LABORTECHNIK

Wehingen, den 01.05.2014

Alexander Hermle
Geschäftsführer, Managing Director

© Hermle Labortechnik GmbH

Table 1: Technical Data

Manfacturer	**HERMLE Labortechnik GmbH**			
Type	**Z 216 MK**			
Dimensions				
Width	28 cm			
Depth	55 cm			
Height	29 cm			
Weight without rotor	35 kg			
max. speed	15000 min^{-1}			
max. volume	44 x 2ml			
max. RCF	21380 x g			
allowable density	1,2 kg/dm^3			
allowable kinetic energy	7060 Nm			
Mains power connection AC	230 V / 50-60 Hz 1 ph		120 V / 60-50 Hz 1 ph	
Voltage fluctation	± 10 %		± 10 %	
Current consumption	2,4 A		5,1 A	
Power consumption	500 W		560 W	
Radio interference	IEC 61326-1			
Audit requirement (BGR 500)	no			
Ambient conditions (EN/IEC 61010-1)				
- Environement	for indoor use only			
- High	Use up to an altitude of 2000 m above MSL			
- Ambient temperature	2°C up to 35 °C			
- Max. relative humidity	Max. relative humidity 80 % for temperatures up to 31°C, decreasing linearly to 50 % relative humidity up to 35°C.			
- Overvoltage category (IEC 60364-4-443)	II			
- Degree of contamination	2			
Class of protection	I			
Not suitable for use in hazardous environements.				
EMV Interference emission , noise immunity	EN / IEC 61326-1 Category B	FCC Class B	EN / IEC 61326-1 Category B	FCC Class B
Noise level (depending on the rotor)	≤ 60 +2 dB(A)			
Write from operator				
Inventory-No.:				
Monitoring-No.:				
Environement:				
Maintenance contract:				
responsible service office	**HERMLE Labortechnik GmbH** **Siemensstrasse 25** **78564 Wehingen** **Tel.: (49)7426 / 96 22-17** **Fax: (49)7426 / 96 22-49**		**or dealer service office**	
responsible dealer				

Table 2: Permissible net weight

Rotor-Number	max speed	permissible weight
220.87 V14	15000 min-1	82 g
220.87 V13	15000 min-1	82 g
221.17 V06	13500 min-1	102 g
220.88 V08	13500 min-1	150 g
220.92 V07	13500 min-1	71 g
221.35 V03	14500 min-1	14 g
221.38 V03	15000 min-1	114 g

Table 3: Lowest temperatures at max. speed

Rotor-Number	max speed	n-max
220.87 V14	15000 min-1	+6 °C
220.87 V13	15000 min-1	+4 °C
221.17 V06	13500 min-1	+7 °C
220.88 V08	13500 min-1	+7 °C
220.92 V07	13500 min-1	+6 °C
221.35 V03	14500 min-1	+4 °C
221.38 V03	15000 min-1	+5 °C

All temperature indications refer to a room temperature of 23°C. By exceeding this value or direct solar radiation to the centrifuge, these values can´t be kept up.

Table 4: Max. speed and RCF-values for permissible rotors

Rotor-Number	max speed	RCF value
220.87 V14	15000 min-1	21380xg
220.87 V13	15000 min-1	21380xg
221.17 V06	13500 min-1	19153xg
220.88 V08	13500 min-1	14463xg
220.92 V07	13500 min-1	14263xg
221.35 V03	14500 min-1	19974xg
221.38 V03	15000 min-1	15342xg

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Table 5: Acceleration and deceleration times

	Acceleration values		Deceleration	
Rotor-Number	level 0	level 9	level 0	level 9
220.87 V14	152	21	173	18
220.87 V13	151	21	217	21
221.17 V06	235	29	258	27
220.88 V08	136	18	133	17
220.92 V07	136	16	180	17
221.35 V03	148	24	320	17
221.38 V03	150	17	95	20
	in seconds			
	Acceleration time from 0 min^{-1} -> U_{max}		Deceleration time from U_{max} -> 0 min^{-1}	

Table 6: Error messages

Error-No.:	Description
1	Imbalance arose
2	Imbalance sensor is defective
4	Imbalance switch has been activated for longer than 5 seconds
8	Transponder in the rotor is defective
11	Temperature sensor is defective
12	Chamber over temperature
14 CLOSE lid	Leap of speed is too big between two mesaurements
33	Open lid while motor is running
34	Lid contact defective
38	Lid motor is blocked
40	Communication with frequency converter distrubed during start
41	Communication with frequency converter distrubed during stop
42	Short circuit in the frequency converter
43	Undervoltage frequency converter
44	Overvoltage frequency converter
45	Over temperature frequency converter
46	Over temperature motor
47	Over current frequency converter
48	Timeout between control unit and frequency converter
49	Other error frequency converter
55	Overspeed
70	Timeout between controler and RS232 interface
99	Rotor is not allowed in this centrifuge
FALSE	Inserted rotor does not exist in the programm
rotor no	Rotor is not detected

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Table 7 (part 1): Radius correction

Rotor No.	*Adapter/Tuberack Order-no.*	*Radius (cm)*	*Correction (cm)*
Angle rotor **220.87**		8,6	0
	704.004	8,2	-0,4
	704.005	7,5	-1,1
Angle rotor **221.17**		9,5	0
	704.004	9,1	-0,4
	704.005	8,4	-1,1
Angle rotor **220.88**			0
0,2ml	704.004	6,6	-1,8
0,5ml	704.005	7,3	-1,1
	37.5055	8,4	0
Angle rotor **220.92**			0
	37.5047	8,1	
		7,8	
Angle rotor **221.38**		6,2	0
Angle rotor **221.35**			0
	701.015	7	-1,5
	701.016	7,3	-1,2
	701.017	7,5	-1,0

Table 8: Abbreviations used

Symbol/Abbreviations	Unit	Description
U (=rpm)	[min^{-1}]	revolutions per minute
RZB(=rcf)	[x g]	relative centrifugal force
PP	-	Polypropylen
PC	-	Polycarbonat
accel	-	acceleration
decel	-	deceleration
prog	-	program

APPENDIX

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Redemption form / Decontamination certificate

Decontamination certificate at goods return delivery

Enclose at all returns of equipment and assemblies absolutely!

The completely full declaration about the decontamination is prerequisite for the assumption and further processing of the return. If no corresponding explanation is enclosed, we carry out decontamination with costs at your expense.

Surname; last name: _____

Organization / company: _____

Street: _____

ZIP CODE: _____ **place:**_____

Telephone: _____ **fax:**_____

E-Mail: _____

Please fill out in block capitals!

Pos.	Crowd	Decontaminated object	Serial number	Description / Comment
1				
2				
3				
4				

Are these parts listed above in touch with the following substances?

Health endangering watery solutions, buffers, acids, alkalis:……..... ☐ Yes ☐ No

Potentially infectious agents: …….. ☐ Yes ☐ No

Organic reagents and solvent: ……..……..... ☐ Yes ☐ No

Radioactive substances: ……..…☐ α..☐ β..☐ γ.. ☐ Yes ☐ No

Health endangering proteins: ……..... ☐ Yes ☐ No

DNA: ……. ☐ Yes ☐ No

These substances have reached the equipment/assembly? ……..☐ Yes ☐ No

Which one, if yes:

_____

Description of the measures for the decontamination of the listed parts:

_____

_____

_____

_____

I confirm the proper decontamination:

Company/dept ._____ place and date: _____

Signature of the authorized person:_____

8. NOTES

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Technische Änderungen vorbehalten.
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